

PATENT SPECIFICATION

1,029,865

DRAWINGS ATTACHED.

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Int. CL—G 08 c /F 06 h.

COMPLETE SPECIFICATION.

Remote Control System for Antenna Rotators.

We, CROWN CONTROLS CORPORATION, a Corporation organized under the laws of the State of Ohio, United States of America, of 40—44 South Washington Street, New 5 Bremen, State of Ohio, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a remote control system for an antenna rotator.

At present, the usual antenna rotators drive radio or television antennas at a speed approximating one revolution per minute. Although it would be desirable to position antennas in an optimum direction at a faster speed, one revolution per minute has been considered the fastest acceptable rate. Due 15 to the weight and length of antennas, acceleration to a faster rotational speed could create too great a torque on the antenna mast when initiating the rotational drive. Also, the momentum of an antenna rotating 20 at a faster speed, when suddenly stopped, may cause the antenna to overrun and thus, it may not be in precisely the position desired or indicated at the control point. Moreover, the user of the antenna rotator control may not know, in advance, the precise 25 antenna position for optimum reception. Therefore, the user must often "feather in" to the precise antenna direction desired. For example, if the antenna is used in connection 30 with a household television receiver, the user would observe the television picture and set the antenna to that position which results in the clearest picture. If the antenna rotates at too great a speed, such "feathering in" would be difficult due to the tendency 35 to overrun.

[Price 4s. 6d.]

With a view to avoiding the foregoing difficulties we provide in accordance with the invention a control system for positioning a remote household television antenna for maximum signal reception said system comprising means connecting a reversible antenna drive motor to an antenna for rotation thereof, switch means connecting a source of current to said motor for selectively actuating said motor in a forward or a reverse direction to thereby rotate said antenna in said forward or reverse direction, and indicator means for indicating the rotary position of the antenna, characterized by speed change means for automatically increasing and subsequently decreasing the speed of rotation of said antenna during its rotary travel in both forward and reverse directions.

By virtue of the speed change means, an antenna can be driven at one rate during the initial and final stages of rotation and at another, faster rate during the remaining portion of its rotation. For example, the antenna may be driven at one revolution per minute during the first and last few degrees of travel and at two revolutions per minute throughout the remainder of travel. The antenna may be rotated at even greater speeds by gradually increasing the rotational speed at the beginning of travel and gradually decreasing the speed at the end of travel.

As an automatic antenna rotator we may utilize the plural motor remote control system described in U.S. Patent 3,102,278 which issued on Aug. 20, 1963. This remote control system utilizes a proximal motor which is similar to the antenna drive or distal motor, each having two sets of field windings cooperating for driving the motors in a selected direction. The distal motor is

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selected so as to have a speed slightly greater, although not much greater, than the speed of the proximal motor, so that when the distal motor drives a load, such as an antenna, the load slows the distal motor so as to have substantially the same rate of speed as the proximal motor. Thus, the two motors are substantially in synchronism. A switch means is described in said U.S. patent having three positions, one is a neutral position, one is for clockwise movement of the proximal motor, and another for counterclockwise movement thereof.

The switch means also includes an actuator having a linear travel for actuating the switch means from one position to another. The actuator is advantageously controlled by a cam member and a cam follower, the cam member having two concentric cam surfaces, one of which has a larger diameter than the other, one for clockwise movement and one for counterclockwise movement. The two concentric cam surfaces are connected by a diagonal surface, the midpoint of which desirably places the switch actuator in the neutral or "off" position. The cam member may be manually moved to actuate the switch means into selected positions causing the distal motor to rotate either in a clockwise or in a counterclockwise direction. The proximal motor is actuated at the same time to drive the cam follower back to the diagonal, neutral or "off" position. Thus, as the distal motor drives the load, the proximal motor drives the cam actuated switch means to its "off" position. The instant invention is described herein with relation to such an automatic rotator control. It is to be understood, however, that the instant invention may also be used in connection with a manual or semi-automatic antenna rotator.

Objects and advantages reside in the construction of parts, the combination thereof, the method of manufacture and the mode of operation, as will become more apparent from the following description.

In the drawings:

Figure 1 is a perspective view of a control unit made in accordance with this invention;

Figure 2 is a cross-sectional view of the control unit of Figure 1;

Figure 3 is a plan view of a cam used in the control unit of Figure 1;

Figure 4 is a plan view of a switch used in the control mechanism;

Figure 5 is a cross-sectional view of a portion of the switch, as viewed in the direction of arrows 5-5 of Figure 4;

Figure 6 is an enlarged view of a portion of a drive mechanism made in accordance with this invention;

Figure 7 is a schematic wiring diagram of

the control system made in accordance with this invention;

Figure 8 is a schematic illustration of a modified control system made in accordance with this invention.

Referring to the drawings in greater detail and in particular to Figures 1 and 2, the reference character 10 indicates broadly the housing for a control unit made in accordance with this invention. The control unit includes a control or proximal motor 14, a transformer 16, a switch mechanism 18, an adjustable cam 20 and a pointer 22.

Referring to Figures 6 and 7, an antenna drive, servo or distal motor 24 is connected in parallel with the proximal motor 14. As will be described below, the distal motor 24 is mounted in close proximity to an antenna mast 150 and is driven substantially in synchronism with the motor 14. Although the motors are not synchronous, the motors have been selected with such speed characteristics that the two motors have substantially identical speeds under normal load conditions. In order to prevent the antenna leads from being twisted, it is necessary to confine the rotary motion of the distal motor 24 in each direction to one revolution of the antenna driven thereby plus a few degrees as, for example, to an angle of 365° in each direction. Since the mechanism for limiting the rotation of the motors in either direction forms no part of the instant invention and such mechanism is described in our U.S. Patent 3,102,218, it is not described in detail herein.

With reference to Figure 7, the secondary winding of the transformer 16 has one terminal grounded at 30, the grounded terminal being series connected to one terminal of each of the windings 32 and 34 of the motor 14 and to one terminal of each of the windings 36 and 38 of the distal motor 24. The switch mechanism 18 may have a contact 40 adapted to be series connected through a movable contact 50 to the secondary winding of the transformer 16 to supply electrical energy directly to the windings 34 and 38. A phase-shifting impedance, such as a condenser 42, connects the ungrounded terminals of the windings 32 and 36 to the contact 40. By this arrangement, as is well known to those skilled in the art, a leading current is supplied to the windings 32 and 36, which current leads the current supplied to the windings 34 and 38. This will cause the motors 14 and 24 to rotate in one direction. By shifting the contact 50 from the contact 40 to a contact 44, the current from the secondary winding of the transformer 16 is then supplied to the ungrounded terminals of the windings 32 and 36, the leading current being then supplied to the ungrounded terminals of the windings 34 and

38, thus reversing the direction of the motors 14 and 24.

Referring to Figure 4, in connection with Figure 7, the switch mechanism 18 for accomplishing the reversal of direction of rotation of the motors 14 and 24 is constructed as follows. The movable contact 50 is mounted upon an actuating bar 52 that is slidably mounted such that the contact 50 may be selectively engaged with a centrally located open contact 54 and either of the contacts 40 and 44. Mounted upon the opposite side of the actuating bar 52 from the contact 50 is another movable contact 56 adapted to engage an open transformer contact 58 when the contact 50 is engaged only with the contact 54. Note that the length of contact 54 is insufficient to space the distance between the contacts 40 and 44. Both contacts 50 and 56 are sufficiently short that they may be set to engage only the open contacts 54 and 58, respectively. When the actuating bar 52 is moved such that the contact 50 engages the contact 40, the contact 56 will then be in engagement with a transformer contact 60a, which completes a circuit through the primary winding of the transformers 16 and the source S. Similarly, when the actuating bar 52 is positioned to place the contact 50 in engagement with the contact 44, the contact 56 will be engaged with a transformer contact 60b. The contacts 60a and 60b are connected together such that the primary winding of the transformer 16 is connected to the source S regardless of which of the contacts 60a or 60b is engaged by the contact 56. As apparent from an inspection of Figures 4 and 7, the movable contact 50 is also adapted to engage a contact 40a and a contact 44a which are, respectively, electrically the same as the contacts 40 and 44. At the same time, the movable contact 56 is adapted to engage fixed contacts 60c and 60d at the extreme ends of movement of the actuating bar 52, which contacts are electrically identical to the contacts 60a and 60b. The latter contacts 40a, 44a, 60c and 60d are required for actuating of a speed change mechanism which will be described in detail below.

The fixed switch contacts 40, 40a, 44, 44a, 54, 58 and 60a through 60d are mounted on spaced support members 64, there being five such support members 64 on each side of the actuating bar 52. For clarity, the spacing between the support 64 is somewhat magnified in Figure 2. Support for the members 64 is provided by a switch support plate 66 rotatably mounted in a bushing 68, which in turn is integrally formed in a frame member 74 fixedly mounted upon a bracket 76 supported in the bottom of the housing 10. The switch support plate 66 is provided with a downwardly extending annular geared flange 78 having internal gear teeth 80 mesh-

ing with a pinion 82 mounted for rotation upon the frame member 74. The pinion 82 is driven by a drive gear 84, which in turn is rotated by a variable speed gear mechanism, generally designated 86, to be described below. The input gear 88 of the gear mechanism 86 derives its rotation from a pinion 90 driven by the motor 14. As will appear below, when the motor 14 rotates in one direction, the entire switch mechanism mounted upon the plate 66 rotates in a clockwise direction and when the motor 14 rotates in the opposite direction, the switch mechanism rotates in a counterclockwise direction.

The mechanism for driving the actuating bar 52, and accordingly controlling the switch mechanism 18, is illustrated in Figures 2, 3 and 4 and includes the cam member 20, which has a cam groove 102 therein, within which is received a cam follower pin 104 mounted on one end of the actuating bar 52. The cam member 20 has a peripheral portion 100 mounted for rotation on the frame member 74. A cover plate 106 for the housing 10 has a plurality of depending hooks 108 projecting through cooperating apertures in the peripheral portion 100 of the cam 20 such that one may manually rotate the cover member 106 in turn to rotate the cam 20. Notations may be made on a scale 110 on the control housing 10, the notations cooperating with an indicant 106a, whereby the user of the device may set the indicant 106a to a selected position 100 on the scale 110 which corresponds to a desired direction of antenna position.

Referring to Figure 3, the cam groove 102 consists of an outer circular portion 102a and an inner circular portion 102b connected by a generally diagonal or median connecting portion designated 102c. The cam grooves 102a and 102b provide two concentric, radially offset cam surfaces and the diagonal or median portion 102c provides a plurality of radially decreasing cam surface steps, designated 102d, 102e and 102f. The cam follower pin 104, and thus the bar 52, are moved linearly only when the pin 104 is slidingly engaged with one of the radially decreasing steps 102d, 102e or 102f. If the cam follower pin 104 is in the grooved portion 102a, the contact 50 is engaged with contacts 44 and 44a and the motor 14 drives the cam follower 104 in a clockwise direction, as viewed in Figure 3. Since the cam portion 102a is circular, the actuating bar 52 is not moved relative to the fixed contacts 44 and 44a during the travel of the pin 104 in the groove 102a. As the pin 104 engages the portion 102d, the bar 52 is moved relative to the fixed contacts until the cam follower 104 reaches substantially the midpoint of the center step 102f of the connecting groove 102c, at which time only the open 130

contacts 54 and 58 are engaged by the contacts 50 and 56, respectively. Thereupon, both the motor 14 and the motor 24 are disconnected from the source 3 and the rotation of the motors 14 and 24 will be arrested. If the cam follower 104 is located in the inner groove 102b, as viewed in Figure 3, the cam follower 104 will similarly be rotated in a counterclockwise direction until it reaches the midpoint of the step 102f, whereupon the switch 18 will again be open-circuited.

The pointer 22 is mounted by pins 120 upon spaced flange members 122, 124, 126 and 128, which have opposed surfaces providing a guideway for the actuating bar 52. The midportion, designated 106b, of the cover plate 106 is transparent so that the pointer 22 may be viewed from above the housing 10. As the motor 14 drives the cam-follower support-plate 66, in turn causing the switch 18 to be actuated, the pointer 22 rotates into a position aligned with the indicant 106a. The relationship between the pointer 22 and the indicant 106a is such that they will be aligned when the cam follower 104 arrives at the neutral or "off" position 102f and the rotation of the motors 14 and 24 is thus arrested. Of course, due to the substantial synchronism of the motors 14 and 24, the position of the pointer 22 indicates the antenna position at all times.

The operation of the mechanism thus far described will be apparent to those skilled in the art. The antenna drive or distal motor 24, which is drivingly connected to the antenna mast 150 in any suitable fashion, causes the antenna to rotate if the cam member 20 is rotated to any selected position out of alignment with the pointer 22. This occurs because the cam follower pin 104 is thereby located in one of the circular cam grooves 102a or 102b, causing both the motors 14 and 24 to rotate. The distal motor 24 rotates the antenna while, at the same time, the proximal motor 14 rotates the cam follower pin 104 toward the cam step 102f such that both motors are arrested when the antenna reaches the optimum position for the selected radio or television station. The structure and operation of the motor control system thus far described is similar to that described in our U.S. Patent 3,102,218.

It will be appreciated that, by the provision of the several steps in the cam groove 102, it is possible to actuate several switches or other mechanisms for changing the rotational speed of the antenna mast 150 and of the cam follower pin 104. In accordance with this invention, it is desired that the speed of rotation of the antenna be increased by increments up to a maximum speed and as it comes to the end of its travel, the speed of rotation of the antenna is described

by increments. This is accomplished in the embodiment disclosed herein by utilizing the steps 102d and 102e in the cam groove 102, the portions 102d and 102e being on each side of the median step 102f and separated therefrom by radially offset steps 102g and 102h, respectively. As the cam 20 is rotated relative to the cam follower pin 104, so as to offset the cam follower position from the neutral, median position 102f, either the contact 40 or the contact 44 is engaged by the contact 50, whereupon the antenna is rotated at substantially one revolution per minute. The initial rotational speed remains constant while the pin 104 moves along the steps 102g and 102h. As the cam follower pin 104 moves along the radially varying steps 102d or 102e toward either the groove 102a or 102b, the bar 52 is moved relative to the fixed contacts to actuate mechanism for changing the rotational speed of the antenna. The mechanism for changing the speed of rotation of the antenna could take a variety of forms. For example, variable speed motors could be used. The presently preferred embodiment disclosed herein is to provide switch controlled means for varying the gear mechanism 86 between the motor 24 and the antenna mast 150. This gear mechanism 86 is identical for both the antenna drive shown in Figure 6, and for the cam follower drive, shown in Figure 2.

Schematically illustrated in Figure 6 is the rotatable antenna mast 150, upon which is affixed an antenna drive gear 152 driven by the output gear 154 of the antenna gear drive mechanism 86 mounted upon a bracket 156 that in turn is supported upon a suitable fixed support 158. The gear mechanism 86 includes a center shaft 160, which is mounted for rotary and lineal movement within a pair of spaced bearing members 162 supported by the bracket 156. A comparison of Figures 2 and 6 will reveal that the pinion 90 may either be cut into the surface of the output shaft of the motor associated therewith, as indicated in Figure 6, or may be splined therein, as indicated in Figure 2. The input gear 88, which is coaxial with the center shaft 160, derives its support from an enlarged portion 164 of the shaft 160. Mounted upon the input gear 88 on an axis offset from the shaft 160 is a vertically upright spindle support 88a for a two-part planet gear 166 having a smaller geared portion 166a meshed with the teeth of a sun gear 168 fixedly connected to and coaxial with the center shaft 160. The larger geared portion, designated 166b, of the planet gear 166 is meshed with the teeth of a ring gear 170, which is mounted upon the same plate, designated 172, to which the output gear 154 is mounted. Both gears 154 and 170 are also coaxial with the center shaft 160. A first annular friction clutch 130

plate 174 is affixed to the base of the ring gear 170 and a second annular friction clutch plate 176 is affixed to the top of the input gear 88. The center shaft 160, and accordingly the portion 164 and the input gear 88 are biased vertically upwardly, as viewed in Figure 6, by a spring member 178 affixed to the lower leg of the bracket 156. So long as the center shaft 160 is so biased upwardly, creating engagement of the clutch plates 174 and 176, which is the position illustrated in Figure 6, there is a direct reduction drive between the pinion 90 and the output gear 154, since the gears 88, 166, 168 and 154 rotate as a unit. The gear reduction is so designed that the member 150 is rotated at substantially one revolution per minute.

Supported upon the lower leg of the bracket 156 and coaxial with the shaft 160 is an annular solenoid 140 including a solenoid coil 140z nested within a hollow cup-shaped housing or support member 140b, having a vertically oriented, annular outer periphery. The armature of the solenoid 140 comprises a clutch disc 140c integral with or affixed to the center shaft 160. Upon energization of the solenoid coil 140z, the disc 140c is drawn into engagement with the top surface of the member 140b. The top surface of the portion 140b and the lower surface of the clutch disc 140c constitute friction clutch surfaces such that, when engaged, the disc 140c cannot rotate. Accordingly, the center shaft 160 and the sun gear 168 carried thereby will be restrained from rotation. At the same time, the portion 164 lowers with the clutch disc 140c, wherupon the clutch plate 176 becomes disengaged from the clutch plate 174 so that the gear 88 may rotate relative to the gear 170. As apparent, when the pinion 90 is then rotated, the planet gear 166 will revolve about the sun gear 168 creating a faster drive for the ring gear 170 and, therefore, the output gear 154. Thus, when the solenoid 140 is energized, the speed of rotation of the output gear 154 and, accordingly, the load driven thereby, is increased. It should be noted that the gear mechanism 86 is so designed that the output speed is independent of the direction of rotation, also it may be observed in Figure 5 that parts of gear mechanism which are fixedly connected together, such as the sun gear 168 and the shaft 160, may be integral.

Since identical gear assemblies 86 and speed change mechanisms, or solenoids 140, therefor are used in connection with both the proximal motor 14 and the distal motor 24, the circuitry for insuring that the speed change of the antenna mast 150 is reflected in the control housing 10 is comparatively simple. Referring to Figure 7, both solenoids 140 have one terminal connected to the ground 30 and another terminal connected to switch contacts 142 mounted on a pair of support members 64 at opposite ends of the array of members 64. The contacts 142 are adapted to be engaged by a sliding contact 144 (see Figure 5) carried by the actuating bar 52 and spaced from the movable contact 50. The movable contact 144 also engages a plurality of open contacts 146 intermediate the two contacts 142. As apparent, when the cam 20 is rotated such that the cam follower pin 104 is located within the cam portions 102g or 102h, the contact 144 will not have contacted either of the contacts 142. The solenoids 140 thus are not energized. However, as the cam 20 is rotated such that the cam follower is relatively moved with respect to the cam groove 102 such that it passes along either of the grooved portions 102d or 102e, the bar 52 is moved linearly whereupon the contact 144 engages one of the contacts 142, causing both solenoids 140 to be energized.

Figure 8 schematically illustrates a more elaborate speed change system. A cam groove 202 is illustrated having diagonal portions 202a, 202b, 202c, 202d and 202e therein. A cam follower 204 is shown located in the cam groove 202 with an actuating bar 252 attached thereto adapted to drive a contact member 250 relative to a plurality of spaced contact elements 260, 262, 264, 266, 268 and 270. The line connection to the contact member 250 is indicated by contact member 272. It will be appreciated that, as the cam groove 202 moves relative to the cam follower 204, the contact member 250 will selectively engage the various contacts 260, 262, 264, 266, 268 and 270. The various contact members 260 through 270 may be used to control either mechanical, electrical, or electrical-mechanical means for changing the speed of rotation of the proximal and distal motors 14 and 24 or the loads driven thereby. Therefore, it may be seen that by providing the more elaborate cam groove 202, a variety of rotational speeds may be made available. Of course, it is to be understood that Figure 8 is only schematic and that the cam groove 202 will actually be arcuate, each of the diagonal portions 202a through 202e being radially offset, as in the case of the cam groove 102 shown in Figure 2. Similarly, the various elements 250 through 272 may correspond to the elements of the switch 18 shown in Figure 4.

In review, in the embodiment described in Figures 1 through 7, the motors 14 and 24 are rotated at substantially one revolution per minute when the pin 104 is located in either cam step 102g or 102h, because the contact 50 is accordingly engaged with either the contact 40 or the contact 44. As the

cam follower 104 is moved relative to the cam groove 102 along either groove portion 102d or 102e, the solenoids 140 are energized, since the movable contact 144 engages one of the fixed contacts 142. Upon energization of the solenoids 140, the rotational speed of the output gears 154 is increased. This speed increase may be of the order of 2 to 2.5 times the initial rotary speed of the gears 154. Accordingly, the antenna will be driven at two or two and one-half revolutions per minute. The initial relative movement of the cam follower 104 relative to the cam groove 102 is caused by rotation of the cam member 20 upon manual rotation of the cover member 106. Thereafter, the proximal or control motor 14 drives the cam follower 104 back to the midpoint of the step 102f. As the cam follower 104 is so driven, if located in either groove portion 102a or 102h, the antenna 150 will be driven at the increased speed.

When the cam follower reaches the step 102d or 102e, as the case may be, the antenna speed is reduced to substantially one revolution per minute. The rotation of the motors 14 and 24 is then arrested when the cam follower reaches the step 102f. Thus, the antenna speed is automatically increased up to a faster rate than presently deemed acceptable. At the same time, there is no great surge of torque upon the antenna mast because the initial speed approximates one revolution per minute. Similarly, it is possible to accurately "feather in" to an optimum antenna direction, since the antenna speed slows to one revolution per minute before coming to a stop. The steps 102g and 102h may represent approximately 10° of antenna rotation so that minor antenna direction adjustments may easily be made with the antenna rotating at only one revolution per minute within 10° on each side of the antenna position. The system schematically illustrated in Figure 8 provides a further extension of the principle disclosed in Figures 1 through 7.

Although the presently preferred embodiment of the device has been described, it will be understood that within the purview of this invention various changes may be made in the form, details, proportion and arrangement of parts, the combination thereof and mode of operation, which generally stated consist in a device capable of carrying out the objects set forth, as disclosed and defined in the appended claims.

WHAT WE CLAIM IS:—

1. A control system for positioning a remote household television antenna for maximum signal reception said system comprising means connecting a reversible antenna drive motor to an antenna for rotation thereof, switch means connecting a

source of current to said motor for selectively actuating said motor in a forward or a reverse direction to thereby rotate said antenna in said forward or reverse direction, and indicator means for indicating the rotary position of the antenna, characterized by speed change means for automatically increasing and subsequently decreasing the speed of rotation of said antenna during its rotary travel in both the forward and reverse directions. 65

2. A system according to claim 1, wherein said switch means has an actuator carrying at least one switch contact, a manually adjustable cam member being provided and being settable in accordance with desired antenna position, said cam member having two concentric surfaces connected by a diagonal cam surface, and a cam follower connected to said actuator and being disposed to follow said cam surfaces, the arrangement being such that when the cam follower cooperates with the concentric surfaces said actuator will be moved into a position causing said switch means to connect said source of current to said drive motor to operate the same at a predetermined speed. 70

3. A system according to claim 2, wherein said diagonal cam surface has a plurality of steps of decreasing radius whereby said actuator is moved to a plurality of different switch positions upon relative movement of said cam member and said cam follower, at least one of said switch portions serving to disconnect said source of current from said drive motor. 80

4. A system according to claim 2 or 3, wherein a further motor is operatively connected to said indicator means for driving the same and being energized by said source of current when connected therewith by said switch means, said switch means effecting such connection when said cam member is manually adjusted from a position in which the antenna is stationary to a nearby desired position of the antenna, said further motor and antenna drive motor being synchronously operated whereby the instantaneous position of the indicator means is related to antenna position, both motors being simultaneously deenergized in 110 said one of said switch positions. 105

5. A system according to claim 4, wherein when said cam follower cooperates with predetermined portions of said diagonal cam surface, said actuator is moved into a position to actuate said speed change means at predetermined intervals during the rotary travel of the antenna. 115

6. A system according to claim 5, wherein said diagonal surface defines a plurality of surfaces of changing radii. 120

7. A system according to claim 4 or 5, wherein said means connecting said drive motor to said antenna and said further

motor to said indicator means comprises individual variable speed gear mechanisms, said speed change means including mechanism varying the ratio between the input 5 and the output of the respective gear mechanisms during the operation thereof.

8. A system according to claim 7, wherein in the speed change means comprises a pair of solenoids, one for each gear mechanism, 10 simultaneously connected to said source of current by said switch means when said cam follower cooperates with said predetermined portions of said diagonal cam surface.

9. A system according to claim 7 or 8, wherein each of said variable speed gear mechanism comprises a center shaft support means mounting said shaft for rotation about and lineal movement along a fixed 15 axis, a sun gear fixedly connected to said shaft for rotation about said axis, an input gear driven by its associated motor and supported on said shaft for rotation about said axis, a ring gear mounted for rotation on said shaft about said axis, an output gear connected to said ring gear and coaxial therewith, a planet gear mounted on said input gear for rotation about an axis offset from said fixed axis, said planet gear including 20 a first geared portion meshed with said sun gear and a second geared portion meshed with said ring gear, first clutch means locking said input gear to said ring gear whereby said input gear and said output gear rotate together, means actuating said first clutch means, said speed change means releasing said first clutch means whereby said ring gear may rotate relative to said input gear, and second clutch means 25 actuated by said speed change means restraining rotation of said shaft and thereby said sun gear when said first clutch means is released whereby said planet gear revolves about said sun gear as said input gear rotates.

10. A system according to claim 9, 30 wherein said first clutch means comprises

cooperating clutch plates on said input gear and said ring gear, said means actuating said first clutch means comprising bias means biasing said center shaft such that said clutch plates are engaged, said solenoid of the speed change means cooperating with said shaft to overcome said bias means. 35

11. A system according to claim 10, wherein said solenoid includes a housing, a coil disposed within said housing, an armature plate affixed to said center shaft, said plate being drawn toward said housing upon energization of said coil, said second clutch means comprising cooperating clutch surfaces on said armature plate and said housing. 40

12. A method of positioning a remotely located household television antenna from a local control unit, characterized by initiating the rotational drive of an antenna at a first speed, driving the antenna at an increased speed after it rotates through a predetermined angle and reducing the rotational speed of the antenna to substantially its first speed as it approaches a predetermined desired position. 45

13. A method according to claim 12, wherein after initiating drive of said antenna at said first speed the antenna is thereafter driven at increasing speeds. 50

14. A method according to claim 13, wherein the antenna is driven at increasing speeds in increments. 55

15. A control system for positioning a remote household television antenna for maximum signal reception substantially as hereinbefore described with respect to the accompanying drawings. 60

16. A method of positioning a remotely located household television antenna from a local control unit substantially as hereinbefore described. 65

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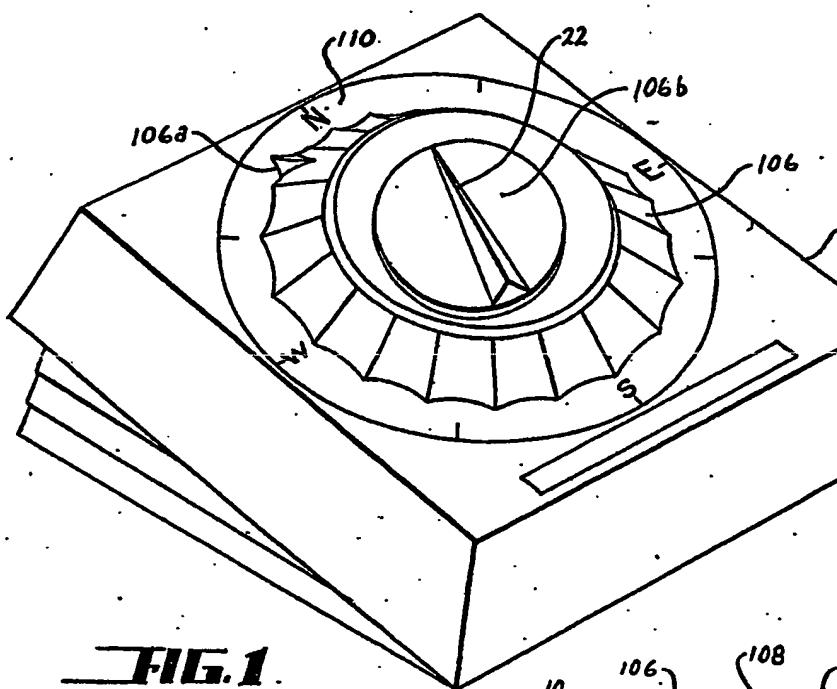


FIG. 1.

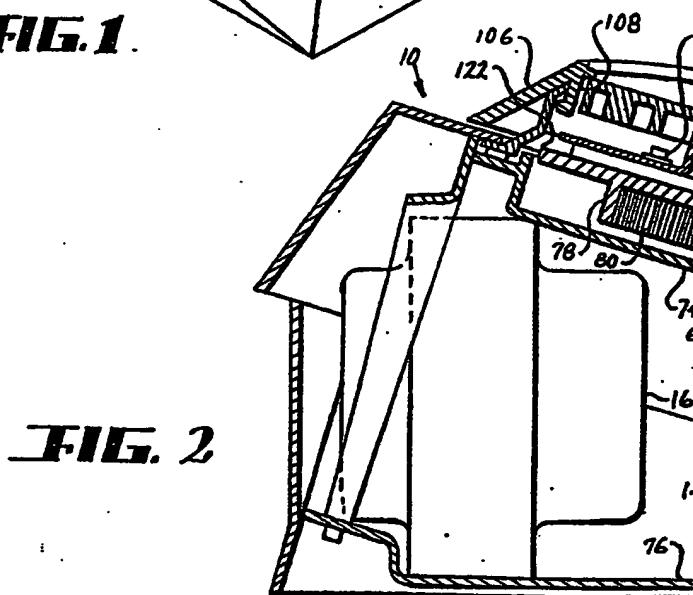
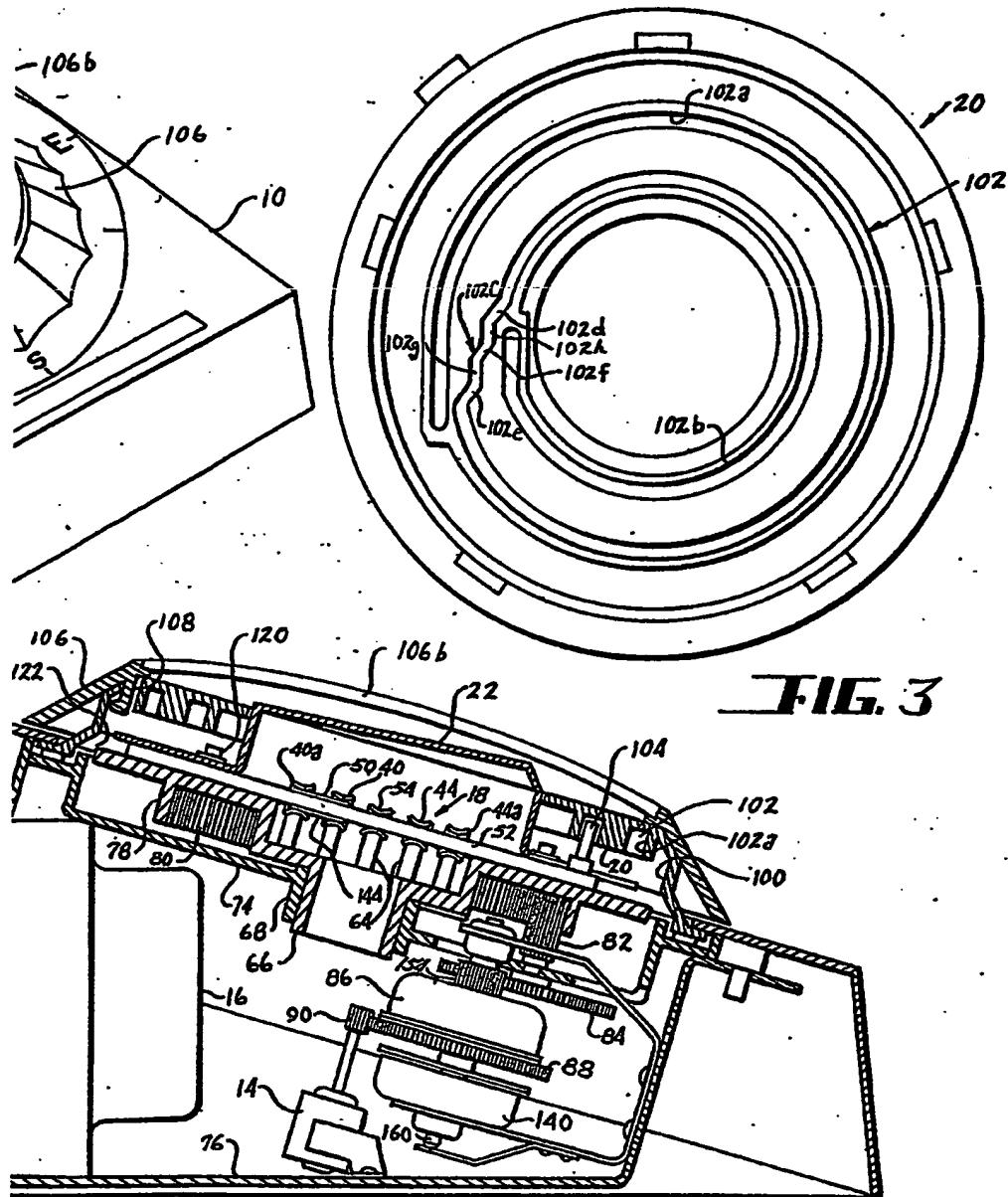


FIG. 2

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 Sheet 1



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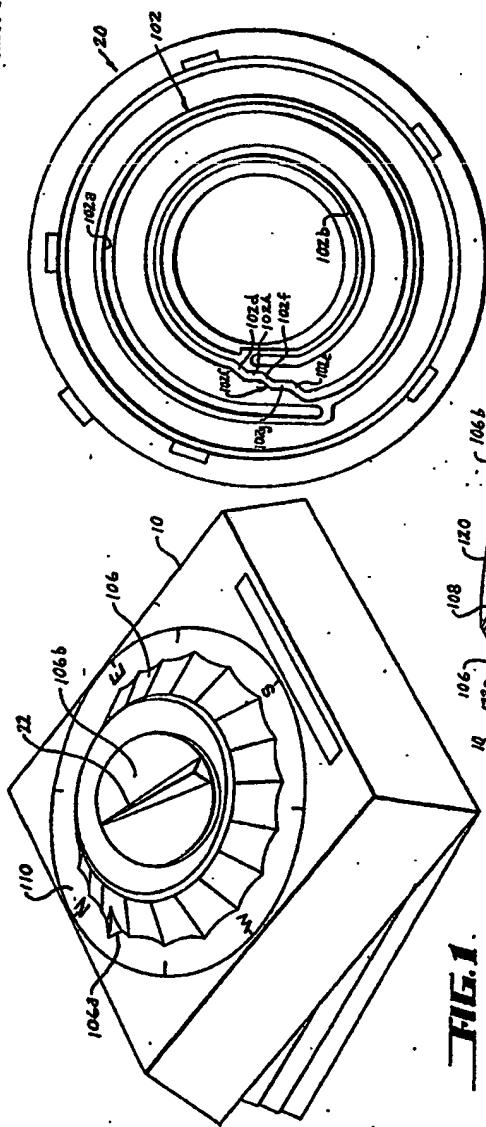
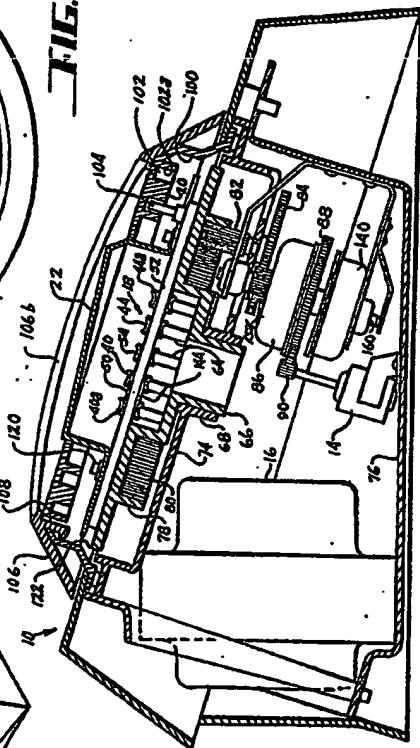


FIG. I.



FILE. 2

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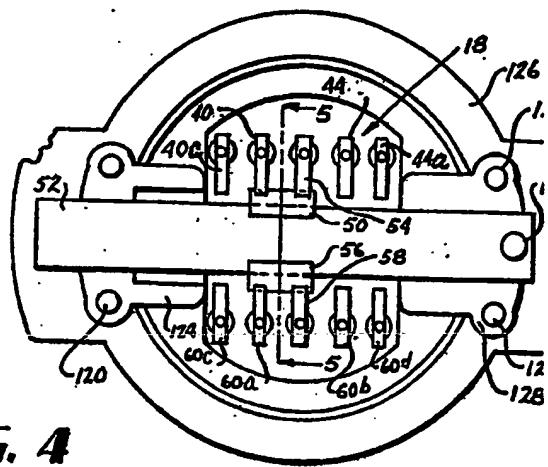


FIG. 4

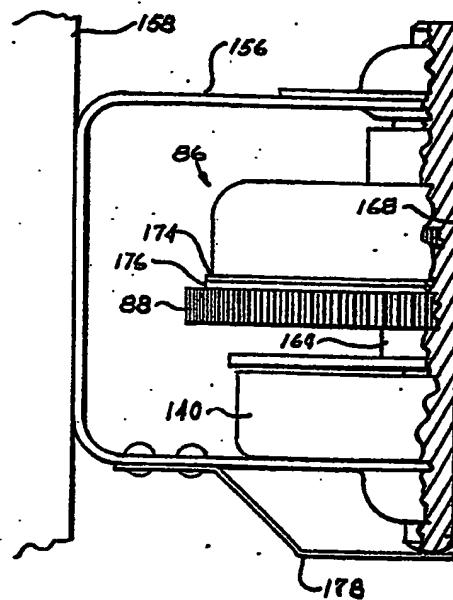


FIG. 6

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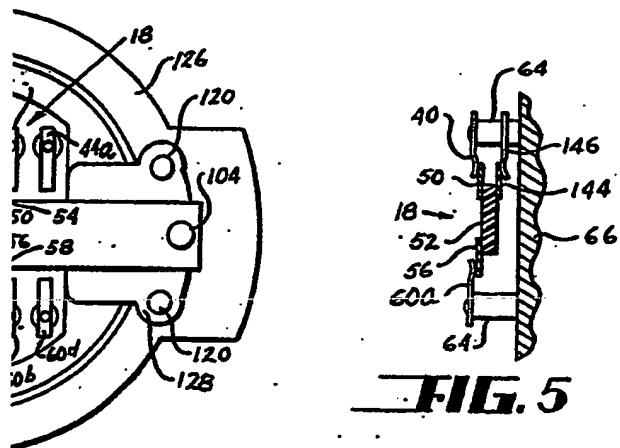
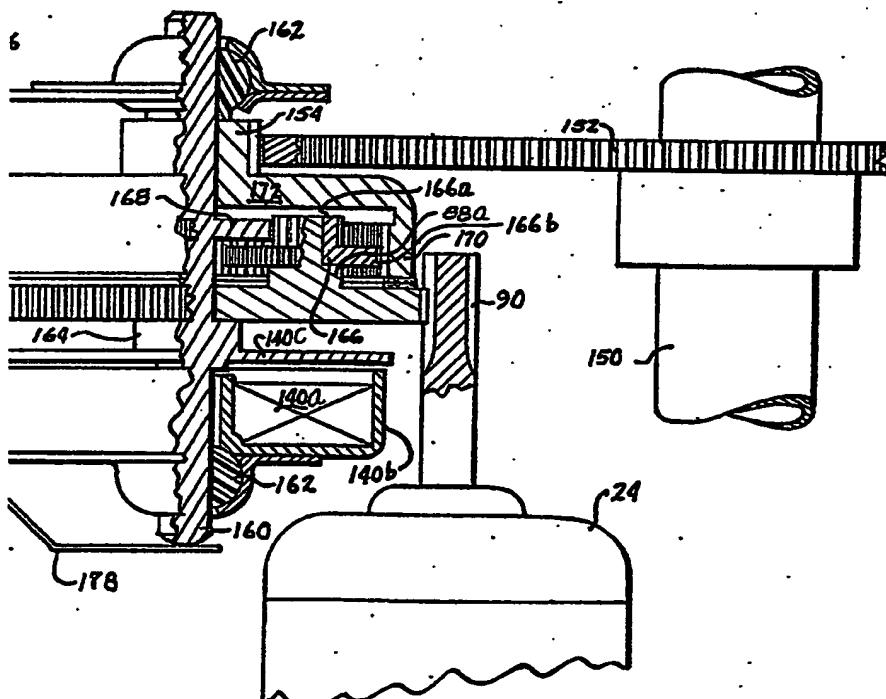


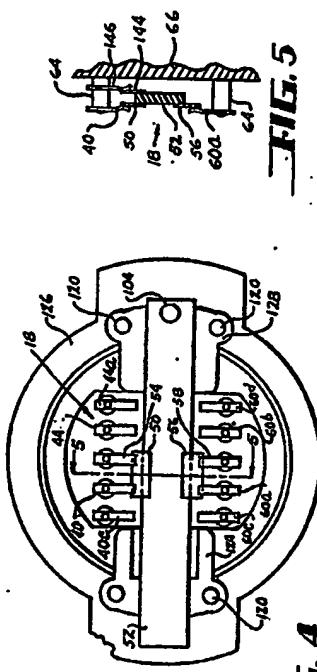
FIG. 5



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B. M. C.

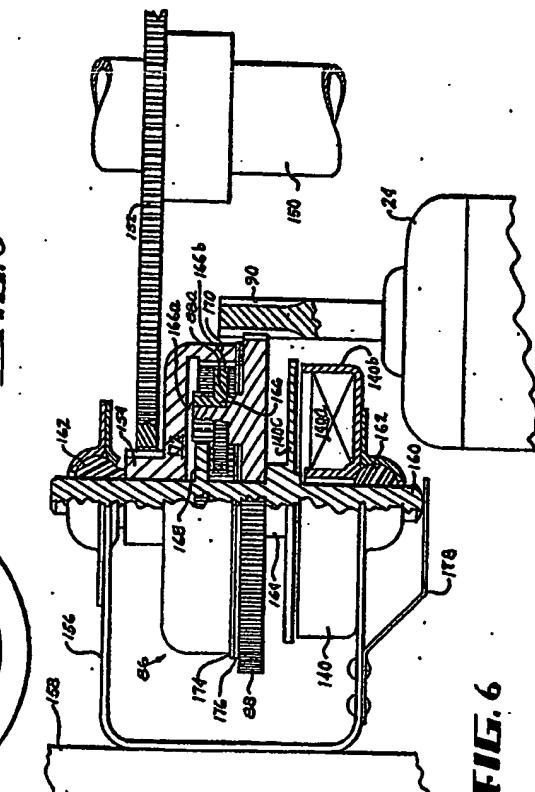
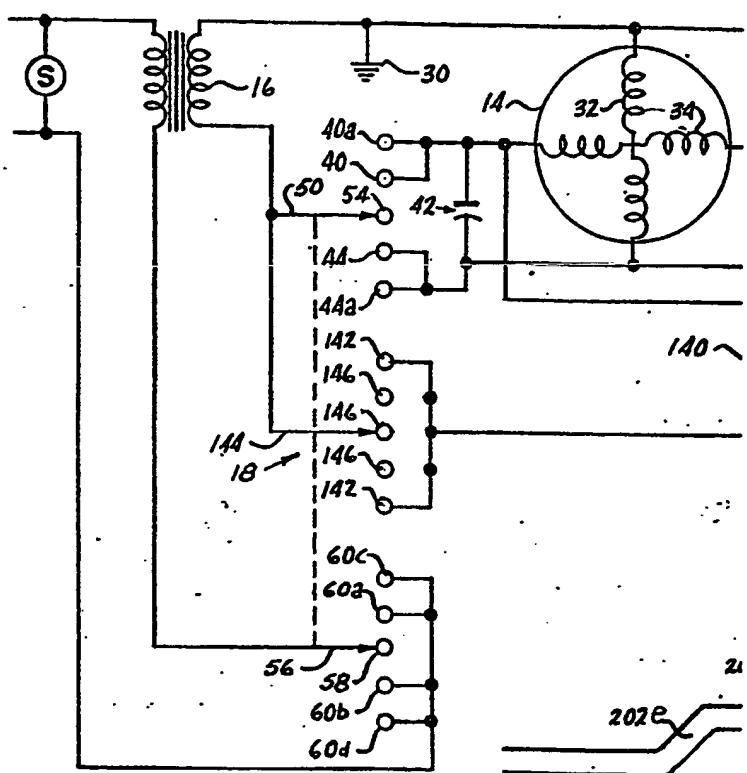


FIG. 6

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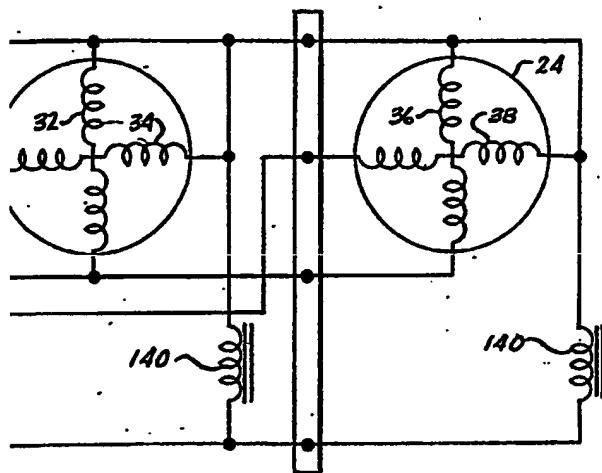


FIG. 7

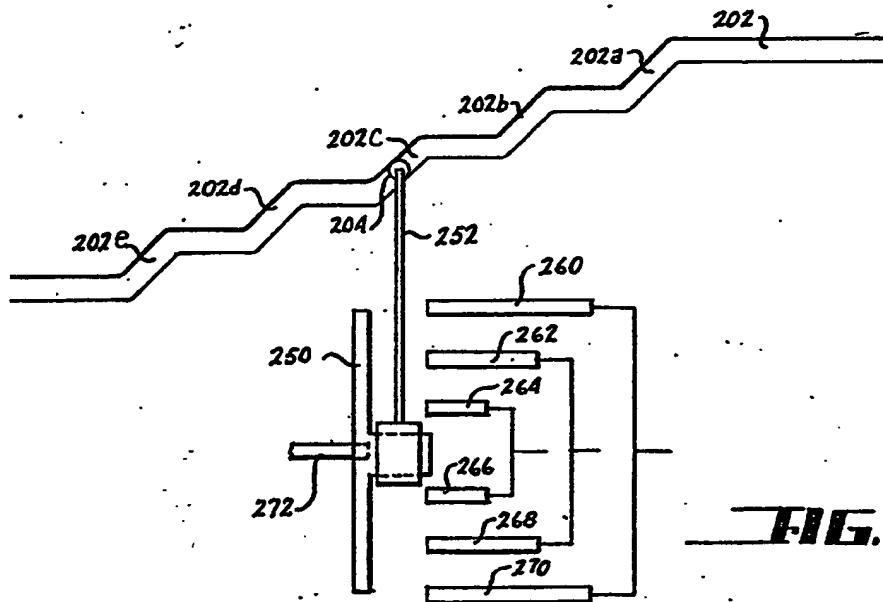


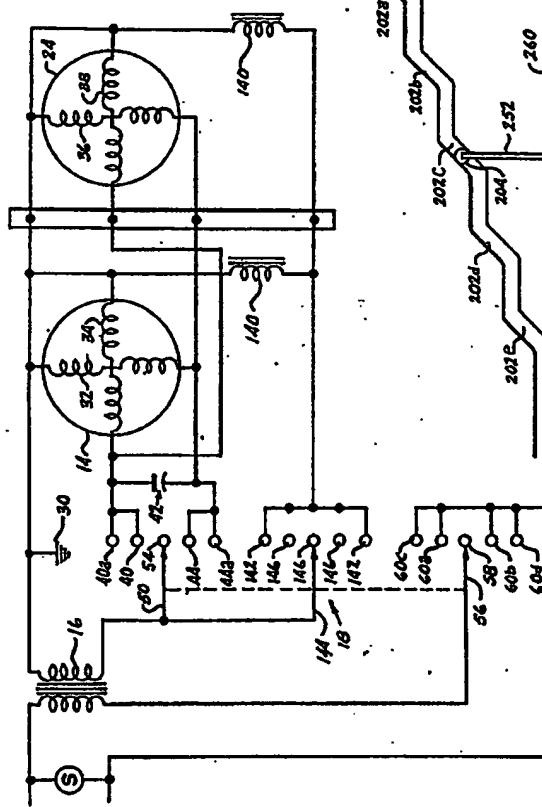
FIG. 8

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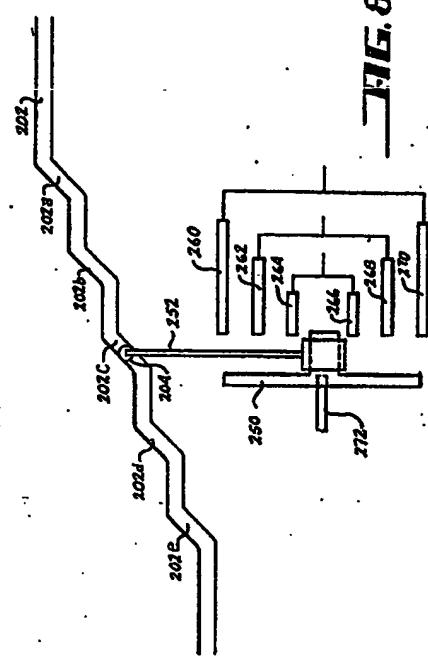
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THE 7.



J.A.E. 8



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